Jan. 2, 1923.

1,440,806

E. H. WHITE.
DAMPER OPERATING DEVICE.
FILED NOV. 8, 1920.

3 SHEETS-SHEET 1

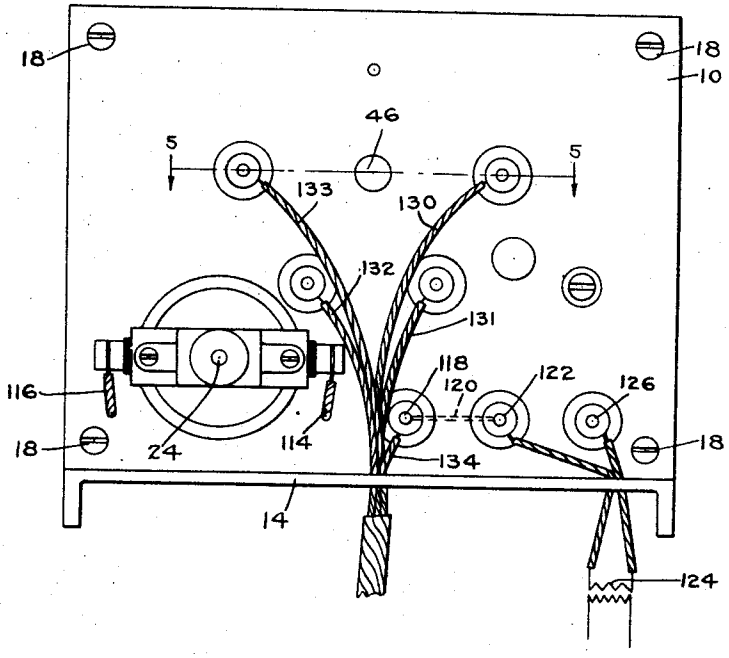

FIG. 1

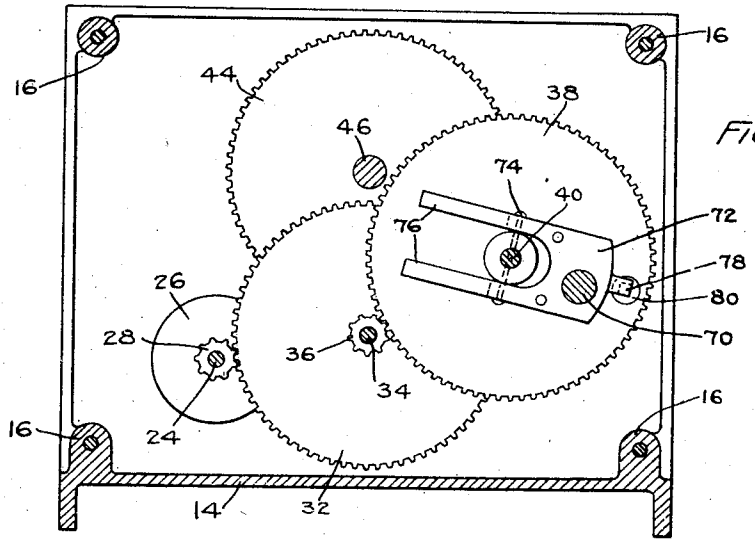

FIG. 2.

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3 SHEETS-SHEET 2

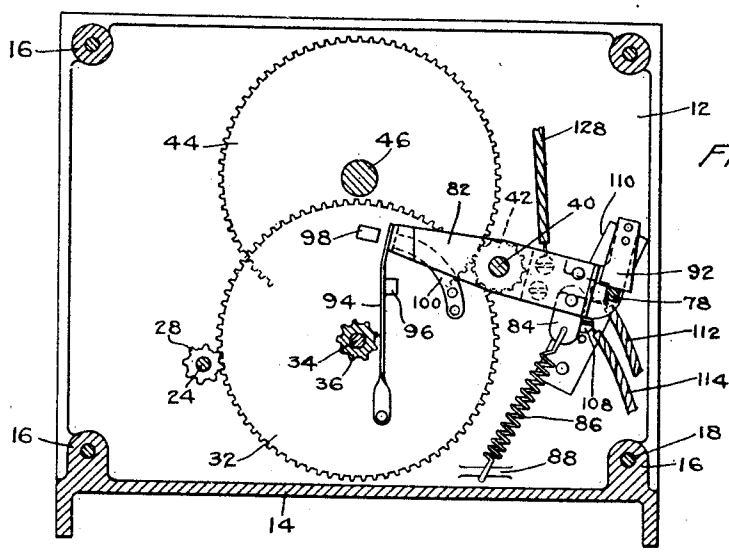

FIG. 3

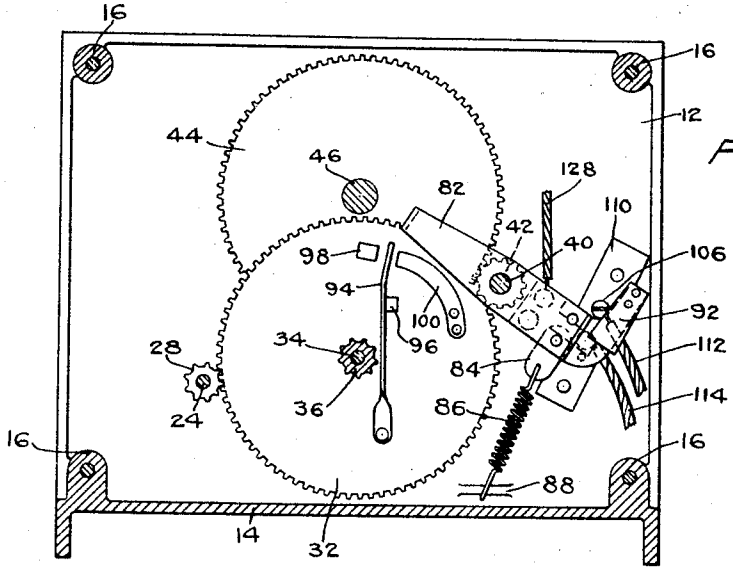

FIG. 4

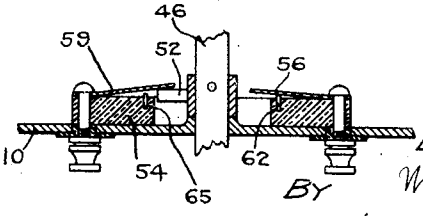

FIG. 5

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3 SHEETS-SHEET 3

FIG. 6.

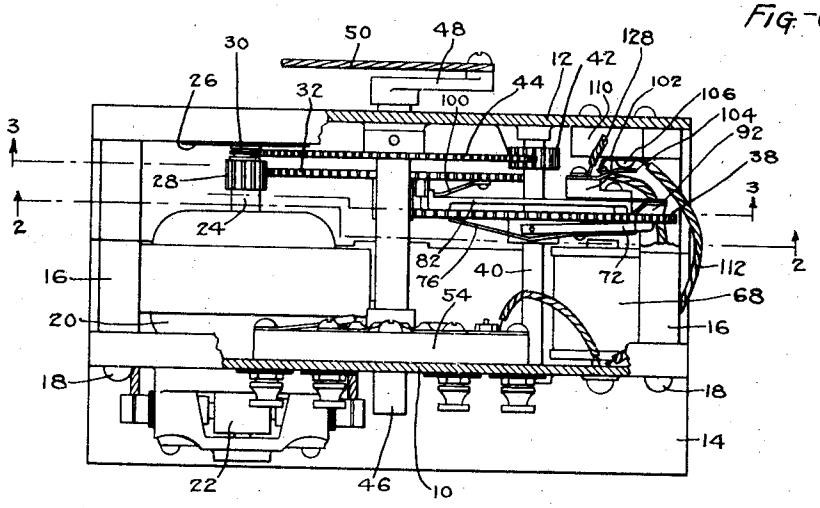
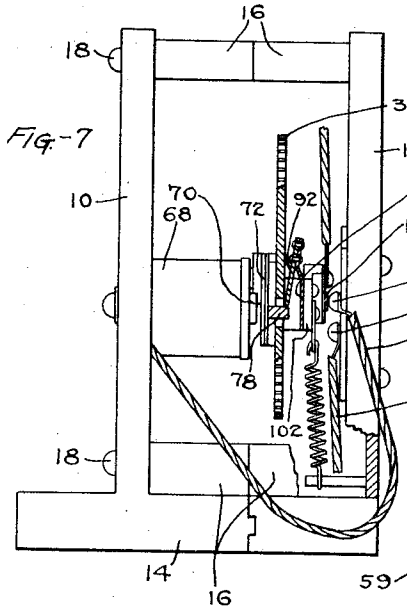
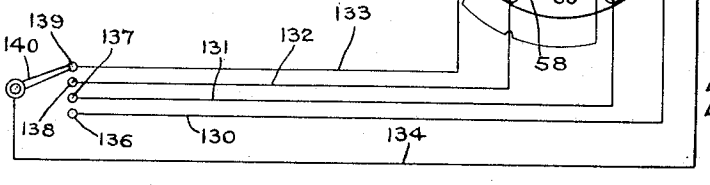
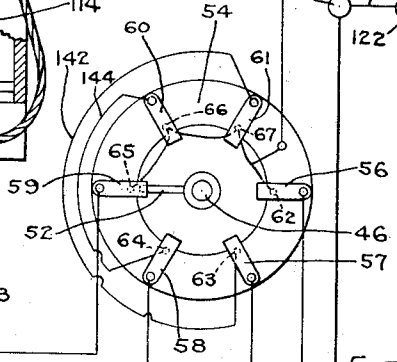


FIG. 7







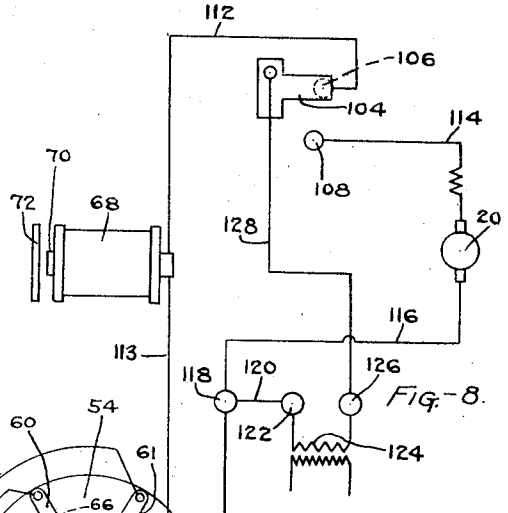


FIG. 8.

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Patented Jan. 2, 1923. 1,440,806

UNITED STATES PATENT OFFICE.

EVERETT H. WHITE, OF ST. PAUL, MINNESOTA.

DAMPER-OPERATING DEVICE.

Application filed November 8, 1920. Serial No. 422,696.

To all whom it may concern:

Be it known that I, EVERETT H. WHITE, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Damper-Operating Devices, of which the following is a specification.

My invention relates to damper operating devices of the type in which an electric motor is used to operate a shaft controlling the position of the dampers such as the customary draft-door and check-draft of furnaces, which shaft will be instantly stopped when the dampers have reached their proper positions. An object is to provide improved means for stopping the damper operating shaft in the exact position to determine the proper setting for the dampers. This invention is in the nature of an improvement on the device disclosed in my Patent Number 1,359,941 dated Nov. 23, 1920.

The full objects and advantages of my invention will appear in connection with the detailed description thereof, and the novel features embodied in my inventive idea will be particularly pointed out in the claims.

In the drawings illustrating the application of my invention in one form,—

Fig. 1 is a side elevational view of the device. Fig. 2 is a view in vertical section on the line 2—2 of Fig. 6. Fig. 3 is a view in vertical section on the line 3—3 of Fig. 6. Fig. 4 is a view similar to Fig. 3 showing some of the operating parts in different position. Fig. 5 is a detail view in horizontal section on the line 5—5 of Fig. 1. Fig. 6 is a top plan view. Fig. 7 is a front elevational view with some of the parts shown in section. Fig. 8 is a wiring diagram showing the electric circuits and connections.

The frame of the device comprises side plates 10 and 12 and a bottom plate 14. These plates are preferably of die-cast metal with the bottom partly integral with the side plate 10 and partly integral with the side plate 12, as shown in Fig. 7. Lugs 16, preferably cast integral with the side plates receive screws 18 which hold the plates together in spaced relation. Mounted between the side plates is an electric motor 20 having a commutator 22 and a driving shaft 24. Secured to this shaft is a governor 26 and loosely mounted on the shaft is a pinion 28 engaged by a spring 30 which holds the pinion frictionally against an enlarged portion of the shaft 24 as will appear from Fig. 6. The pinion 28 meshes with a gear 32 secured to a shaft 34 upon which is secured a pinion 36 meshing with a gear 38 as best shown in Fig. 2, and the gear 38 is secured to a shaft 40 to which is also secured a pinion 42, as shown in Fig. 6 which meshes with a gear 44 secured to a shaft 46. The shaft 46 extends out beyond the side plate 12 and is provided with an arm 48 which is connected to the dampers of the furnace in suitable manner as by a flexible member 50. Secured to the shaft 46 is a lifting arm 52 best shown in Figs. 5 and 8. Secured to the plate 10 and concentrically spaced around the shaft 46 is an insulating ring 54. Secured to the ring 54 are six contact fingers 56, 57, 58, 59, 60 and 61 which, when not lifted by the arm 52, are in contact with fixed contact members 62, 63, 64, 65, 66 and 67, which are inserted in the ring 54. The contact members 65, 66, 67 and 62 in order as shown are connected to each other by wires as shown in Fig. 8. Secured to the plate 10 is an electro-magnet 68 having a core 70. An armature 72 is pivotally attached by a pin 74 to the hub of the wheel 38, as best shown in Figs. 2 and 6 so as to travel around with said wheel, and secured to this armature so as to extend beyond one end thereof are springs 76, the free ends of which rest upon the face of the wheel 38 so as to retract the armature from the core 70 when the electro-magnet is not energized. An outstanding lug 78 on the other end of the electro-magnet extends through a hole 80 in the wheel 38. Oscillatingly mounted on the shaft 40 is an arm 82 secured to the front portion of which is a lug 84 connected by a spring 86 to a lug 88 on the side plate 12 so that this spring tends to swing the arm 82 into the position shown in Fig. 4. In this position, the system of gearing may be rotated by the motor 20. As best shown in Fig. 7, a flat spring 90 is secured to the front end of the arm 82 and secured to the free end of this spring is a strip 92, the lower end of which presses against the side of the gear 38 so as to be in position to be engaged by the lug 78 on the end of the armature when the wheel 38 carrying the same has made one rotation. Near the end of this rotation, the arm 82 is lifted from the position shown in Fig. 4 to that shown in Fig. 3 and the rear end of

this arm then comes against a spring stop arm 94 secured to the gear 32. This spring arm is normally in engagement with a lug 96 on the gear 32 and may yield until it comes into engagement with a lug 98 also on this gear. This serves to resiliently check forward movement of the gearing and, at the same time, the free end of a spring 100 which is secured to the gear 32 comes into engagement with a projection on the end of the arm 82 and prevents backward rotation of the gearing so that the latter is thus locked in both directions. Secured to the front portion of the oscillating arm 82 is an insulating block 102 which supports a contact finger 104 which, when the arm 82 oscillates is caused to move between two contacts 106, 108 secured to an insulating block 110 mounted on the side plate 12. The contact 106 is connected by a wire 112 with the winding of the electro-magnet 68 which is also connected by a wire 113 with the wires which join the contacts 65, 66, 67 and 62. The contact 108 is connected by a wire 114 to one terminal of the electric motor and the other terminal is connected by a wire 116 with a binding post 118. This binding post is connected by a wire 120 with a binding post 122. A suitable source of electrical energy such as the secondary coil 124 of a transformer is connected to the binding post 122 and to a binding post 126, the latter being connected by a wire 128 with the oscillatory contact finger 104. Referring to the diagram shown in Fig. 8, it will be seen that the contact fingers 56, 57, 58, and 59 are provided with suitable binding posts which are connected respectively by wires 130, 131, 132 and 133 with the fixed contacts 136, 137, 138 and 139 of a suitable thermostat and the movable contact member 140 of the thermostat is connected by a wire 134 with the post 118. The fixed contact member 63 is connected by a wire 142 with the contact finger 61 and the fixed contact member 64 is connected by a wire 144 with the contact finger 60. Referring to the fixed contacts of the thermostat, 136 corresponds to the wide open position of the draft door, 137 corresponds to the two-thirds open position, 138 corresponds to the one-third open position, and 139 corresponds to the closed position. Referring to the fixed contacts on the insulator ring 54, 62 corresponds to the open position, 63 and 67 to the two-thirds open position, 64 and 66 to the one-third open position, and 65 to the closed position of the draft door. It is understood, of course, that the checkdraft works oppositely to the draft door.

The operation and advantages of the device will be obvious from the foregoing description. The arrangement of gearing is such that there will be one rotation of the gear 38 for each movement of the lifting arm 52 from any contact finger to the next one of the six contact fingers on the insulating ring. As shown in Figs. 5 and 8, the arm 52 has lifted the contact finger 59 from the fixed contact 65 and has opened the circuit in which the finger 59 is located. At the same time, the member 140 has closed the same circuit at the thermostat, all of the remaining circuits at the thermostat being broken, and hence, all of the circuits at this time are open. As soon as the member 140 shifts to another contact, one of the other circuits is closed, and the electro-magnet is energized, thus attracing the armature 72 and releasing the oscillating arm 82 so that the spring 86 pulls this arm from the position of Fig. 3 to the position of Fig. 4, thus shifting the contact member 104 from the contact 106 to the contact 108 and closing the circuit through the motor 20 which is actuated and causes the gear 38 to make one rotation and carry the armature 72 around with it. Just before this gear has completed its rotation, the lug 78 on the armature engages the strip 92 and lifts the arm 82 in opposition to the tension of the spring 86, thereby lifting the contact member 104 so that the circuit through the motor is broken. The arm 82 comes into contact with the spring 94 so that the movement of the gearing is resiliently stopped and the spring 100 snaps behind the projection on the end of the arm 82 so that the gearing is locked with the armature 72 again adjacent the electro-magnet 68 and in position to repeat the operation for other positions assumed by the movable member 140 of the thermostat.

I claim:

1. A damper controlling device comprising a thermostat, a motor adapted to be set into operation thereby, damper operating means including a rotatable member operable by said motor, an electromagnet positioned adjacent said rotatable member, an armature for cooperating with said electro-magnet and mounted for rotation with said rotatable member, and means for energizing said electromagnet when said thermostat changes from one predetermined position to another.

2. A damper controlling device comprising a thermostat, a motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet positioned adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear, means for energizing said electromagnet when said thermostat changes from one predetermined position to another, and means for stopping said gear when said armature is in functioning position relatively to said electromagnet.

3. A damper controlling device compris-

ing a thermostat, an electric motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet positioned adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear and pivotally connected therewith, means for normally retracting said armature from said electromagnet, means for energizing said motor and said electromagnet when said thermostat changes from one predetermined position to another, and means for stopping said gear when said armature is in functioning position relatively to said electromagnet.

4. A damper controlling device comprising a thermostat, an electric motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet positioned adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear, means for energizing said motor and said electromagnet when said thermostat changes from one predetermined position to another, and means for normally locking said gear from movement in both directions when said armature is in functioning position relatively to said electromagnet.

5. A damper controlling device comprising a thermostat, an electric motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear, a movable contact member, a fixed contact engaged by said movable contact member when in one position whereby said electromagnet is energized when said thermostat changes from one predetermined position to another, and a second fixed contact engaged by said movable contact member when the latter is in another position whereby said electric motor is energized.

6. A damper controlling device comprising a thermostat, an electric motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear, an oscillating contact finger, a fixed contact engaged by said contact finger when in one position, whereby said electromagnet is energized when said thermostat changes from one predetermined position to another, a second fixed contact engaged by said contact finger when the latter is in another position whereby said electric motor is energized, and means for normally holding said contact finger in its first named position.

7. A damper controlling device comprising a thermostat, an electric motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear, an oscillatingly mounted arm, a contact finger carried by said arm, a fixed contact engaged by said contact finger when said arm is in one position whereby said electromagnet is energized when said thermostat changes from one predetermined position to another, a second fixed contact engaged by said contact finger when said oscillating arm moves into another position whereby said electric motor is energized, a lug on said armature for moving and normally holding said oscillating arm in its first named position, and means for normally locking said gear from movement in both directions when said armature is in functioning position relatively to said electromagnet.

8. A damper controlling device comprising a thermostat, an electric motor adapted to be set into operation thereby, damper operating means including a gear operable by said motor, an electromagnet adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear and pivotally connected therewith, means for normally retracting said armature from said electromagnet, an arm oscillatingly mounted on the shaft of said gear, a contact finger carried by said arm, a fixed contact engaged by said contact finger when said arm is in one position whereby said electromagnet is energized when said thermostat changes from one predetermined position to another, a second fixed contact engaged by said contact finger when said arm moves into another position whereby said electric motor is energized, a lug on said armature for moving and normally holding said arm in its first named position, a second gear adapted to be rotated by said motor, a stop member on said last mentioned gear adapted to be engaged by said arm when in its first named position whereby said gears are stopped with said armature in functioning position relatively to said electromagnet and a second member on said last mentioned gear for engaging said arm and preventing backward movement of said gears.

9. A damper controlling device comprising a thermostat, an electric motor adapted to be set into operation thereby, a damper operating shaft adapted to be rotated by said motor, a plurality of fixed contact members radially positioned around said shaft, a corresponding number of yielding contact members positioned over and normally in contact with said fixed contact members, an arm on said shaft adapted to lift said yielding contact members in succession, a gear

adapted to be rotated by said motor, an electromagnet positioned adjacent said gear, an armature cooperating with said electromagnet and mounted for rotation with said gear and pivotally connected therewith, means for normally retracting said armature from said electromagnet, an arm oscillatingly mounted on the shaft of said gear, a contact finger carried by said oscillating arm, a fixed contact engaged by said contact finger when said oscillating arm is in one position whereby said electromagnet is energized when said thermostat changes from one predetermined position to another, a second fixed contact engaged by said contact finger when said oscillating arm moves into another position whereby said electric motor is energized, a spring for moving said oscillating arm into its last named position, a lug on said armature for moving and then normally holding said oscillating arm in its first named position, a second gear adapted to be rotated by said motor, a stop member on said last mentioned gear adapted to be engaged by said oscillating arm when in its first named position whereby said gears are stopped with said armature in functioning position relatively to said electromagnet, and a second member on said last mentioned gear for engaging said oscillating arm and preventing backward movement of said gears.

In testimony whereof I hereunto affix my signature.

EVERETT H. WHITE.